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MORENO VALLEY ANIMAL CONTROL
MORENO VALLEY, CALIFORNIA**

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I. SUMMARY

On December 9, 1991 the National Institute for Occupational Safety and Health (NIOSH) received a request from employees of the Moreno Valley Animal Control (MVAC) to conduct a health hazard evaluation. The requestors were concerned about possible exposure to euthanasia resulting from needlestick injuries and exposure to flea/tick sprays (pyrethrin) and cleaning products. After initial contact with the requestors, the evaluation expanded to include: 1) the potential exposure to human bloodborne diseases during the euthanasia process 2) odors emanating from the refrigerator used to store dead animals.

An inspection of the facility was conducted on July 20-21, 1992. Air samples were collected during the process of spraying the animals with a 0.1% solution of pyrethrin, and work practices were observed during the euthanasia process. Current workers employed as kennel technicians (KTs) or animal control officers (ACOs) were interviewed regarding health symptoms, medical conditions, and work practices. Former employees were interviewed by telephone.

None of the three short-term air samples collected in the personal breathing zones of ACOs found detectable levels of pyrethrin (< 1 mg/M³). The NIOSH Recommended Exposure Limit for pyrethrin is 5 mg/M³. Observations of work practices during the use of cleaning products (common consumer items) indicated that excessive exposures would be unlikely. Also, it was concluded that the amount of euthanasia agents (pentobarbital and potassium chloride) that would plausibly be in the air unintentionally during a needlestick injury would be too small to pose a health risk. There was a putrid odor from decaying road-killed animals in the walk-in refrigerator, and this odor permeated the adjacent euthanasia room.

Two of the former employees had experienced respiratory symptoms that had resolved after discontinuing work. These symptoms were not consistent with asthma, however, they could have been upper airway irritant or allergic reactions related to animal exposure. None of the current employees reported respiratory, dermatologic, or neurologic symptoms associated with their work. Most of the current and former employees acknowledged the unpleasant odor in the refrigerator and euthanasia room, with many employees reporting nausea and/or mild headaches that they associated with the odor.

Over half of the 17 current and former employees interviewed reported sticking themselves with a needle at least once during their employment with MVAC. Although ACOs rarely reused needles, KTs, on the other hand, reported that they almost always reused needles, with most employees killing three or four animals with the same needle and occasional recapping and saving the needle for later use.

In 1992, one employee was diagnosed with previous infection with hepatitis B (HBV) and current infection with hepatitis C (HCV). Serologic tests for the HBV were negative in 1986 during a blood donation. The employee reported none of the risk factors associated with HBV and HCV infections. This investigation could not determine the source of these infections, but non-primate animals are not known sources of HBV or HCV.

Based on the results of this investigation, there was no health hazard from exposure to euthanasic agents, pyrethrin or cleaning products at the time of the NIOSH visit. Whether the respiratory symptoms experienced by two former employees represented work-related upper airway irritant or allergic reactions could not be determined from this evaluation. Although the opportunity for exposure to humans by needlestick was extremely small, NIOSH recommended that MVAC adopt the policy of not reusing or recapping needles. Suggestions for reducing the odor of decaying animals at MVAC are contained in Section IX of this report.

KEYWORDS: SIC 0752 (Animal Specialty Services), bloodborne diseases, hepatitis B, hepatitis C, pyrethrin, respiratory symptoms, neurobehavioral symptoms, neurologic symptoms.

II. INTRODUCTION

On December 9, 1991, the National Institute for Occupational Safe Health (NIOSH) was requested by employees of Moreno Valley Animal Control (MVAC) to evaluate their potential exposure to euthanasic agents, bloodborne pathogens, pesticides, cleaning products, and decaying animals while working at the facility. Reported health symptoms included respiratory, neurologic (arm numbness), and neurobehavioral (headaches, dizziness, nausea) symptoms. The medical conditions of concern were bloodborne diseases (hepatitis B, hepa C, HIV). To evaluate these concerns, NIOSH investigators conduct site visit on July 20-21, 1992.

III. BACKGROUND

The MVAC facility was established in June 1991, in a renovated building that initially served as a turkey hatchery for several decades and a metal duct warehouse for another decade. MVAC is responsible for impounding stray animals; 2) caring for these impounded animals until they are picked up by their owners, adopted, or destroyed (after 30 days); 3) enforcing the city's animal control laws; 4) responding to citizen complaints regarding animals; and 5) collecting and disposing of animals killed on the city's streets and highways.

The facility is staffed by approximately 17 full and part-time employees and 6 to 10 county jail "trustees" fulfilling community service obligations. Trustees are responsible for cleaning the floors and kennels of the 64 kennels. The cleaning compounds are typical household products, such as abrasive cleanser, window cleaner, and bleach. The job titles for the 17 paid employees are: Animal Control Officers (4), Kennel Technicians (4), Dispatch (2), and Clerical (7). Over the 13 months of operation there has been a 142% turn-over among paid employees.

Animal Control Officers (ACOs) impound approximately 1000 animals per month, split evenly between dogs and cats. Most animals are unloaded into the garage and sprayed with Ken AG Aqueous Fly Spray, which contains 0.1% pyrethrin. The product is dispensed from either a pressurized 1-gallon Smith "Home and Garden Sprayer" or a 32-ounce hand-pump sprayer. Spraying requires about 2 minutes per animal. Although other flea and tick control products are available (dips, dusts, and shampoos) at the facility, these are rarely used.

The animals are housed in the kennels for 5 to 15 days. Almost half of the impounded dogs are adopted, but a much smaller percentage of cats find homes, leaving approximately 800 animals per month to be euthanized. Generally, the Kennel Technicians (KTs) are responsible for the euthanasia process, which typically requires two employees. One h

the animal, while the other injects the euthanasic agent (mixture sodium pentobarbital and potassium chloride) intravenously. Curr MVAC requires individuals injecting the animals be "certified" in euthanasia. MVAC does not have a policy on the re-use of needles Individual employees use anywhere from two to ten injections per A walk-in refrigerator, kept at about 40°F, is attached to the euthanasia room. The refrigerator is used for storing dead anima which are removed from the facility each Friday.

On November 12, 1991 an MVAC employee was hospitalized for acute respiratory and chest symptoms possibly due to chemical exposures facility. Although the etiology of these symptoms was not determ this hospitalization, a formal complaint was filed with the Calif Occupational Safety and Health Administration (CAL-OSHA). On Nov 19, 1991, CAL-OSHA conducted an on-site inspection and cited MVAC not having 1) a written emergency action plan, 2) a written fire prevention plan, and 3) a written hazard communication plan. A noticeable odor was noted in the walk-in freezer, but a citation issued due to the lack of an OSHA standard for putrid odors.

IV. EVALUATION DESIGN AND METHODS

A. ENVIRONMENTAL

On July 20-21, 1992, NIOSH investigators conducted an inspec of the facility and collected air samples during the applica of flea and tick spray. Three short-term personal breathing air samples were collected from two ACOs as they sprayed dog an aqueous solution containing 0.1% pyrethrin. The samples collected on glass fiber filters at a flow rate of 2 liters minute and analyzed by high performance liquid chromatograph according to NIOSH Method 5008.¹

B. MEDICAL

The NIOSH physician interviewed the current and former KT's a ACOs regarding health symptoms, health conditions, and work practices.

V. EVALUATION CRITERIA AND HEALTH EFFECTS

A. ENVIRONMENTAL

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation crit for assessment of a number of chemical and physical agents. These criteria are intended to suggest limits of exposure to which most workers may be exposed up to ten hours per day, 40 hours per week working lifetime without experiencing adverse health effects. It

however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below the limits. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposure is controlled at the limit set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are the following: 1) NIOSH Recommended Exposure Limits (RELs), 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs), and 3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs). The OSHA PELs may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH RELs, in contrast, are based primarily on concerns relating to the prevention of occupational disease.

A time-weighted average (TWA) exposure refers to the average air concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits (STEL) or ceiling values which are intended to supplement the TWA where the recognized toxic effects from high, short-term (15 minute) exposures are of concern.

Pyrethrin

Pyrethrin is an insecticide obtained from the chrysanthemum. Exposure can cause dermatitis, upper respiratory symptoms (sneezing, rhinitis), and allergic asthma.²⁻⁴ In a study of California pet handlers, exposure to pyrethrin was only associated with "stomach" pains, which the authors noted, was not consistent with the known toxicity of pyrethrin.⁵ The NIOSH, ACGIH, and OSHA evaluation criteria for exposure to airborne pyrethrin is 5 milligrams per cubic meter (mg/m³), as an 8-hour TWA exposure.

B. MEDICAL

The major infections transmitted by blood are hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus type 1 (HIV). There is no evidence of non-primate animal-to-human transmission of the viruses. Non-primate animals are not known to be susceptible to infections by these viruses.

1. Hepatitis B Virus (HBV)

HBV is a major cause of acute and chronic hepatitis, cirrhosis and primary hepatocellular carcinoma worldwide.⁹ Transmission of HBV occurs by percutaneous or permucosal routes, and infectious blood or body fluids can be introduced at birth, through sexual contact, or by contaminated needles.¹⁰ Persons at increased risk of acquiring HBV infection include members of the following groups: a) parenteral drug users, b) heterosexual men and women and homosexual men with multiple partners, c) household contacts and sexual partners of HBV carriers, d) infants born to HBV-infected mother, e) patients and staff in custodial institutions for the developmentally disabled, f) recipients of certain plasma-derived products (including patients with congenital coagulation defects), g) hemodialysis patients, h) health and public-safety workers who have contact with blood, and i) persons born in areas of high HBV endemicity and their children.¹⁰ For approximately 10% of whites and 14% of blacks with HBV infections, no risk factors are identified.¹¹

HBV can survive for at least one week when dried at room temperature on environmental surfaces, and disinfection, sterilization, and disposal procedures must be adequate to prevent the spread of the virus.¹² The Centers for Disease Control (CDC) has estimated that 12,000 health-care workers whose jobs entail exposure to blood become infected with HBV each year.¹³ Needle stick injuries account for a significant portion of these infections; 6%-30% of persons receiving a needle-stick exposure from an HBV antigen-positive individual (HBsAg) will become infected.¹⁴ Although animal handlers have not been specifically studied, there is no reason to suspect that they would normally be at risk of occupationally acquired hepatitis B since animals other than primates in research laboratories are not a potential source of infection.

2. Hepatitis C Virus (HCV)

In May 1990, serologic tests that detect anti-HCV antibody were licensed and became commercially available in the United States. Studies have shown that HCV is the etiologic agent for the majority of parenterally transmitted or bloodborne non-A, non-B hepatitis worldwide.¹⁰ Because the serologic tests diagnostic

HCV infection have only recently become available, the natural history of this infection needs further study, but links with acute and chronic hepatitis and cirrhosis are well established. The mode of transmission is, in one respect, similar to that of HBV, with parenteral drug users, health-care workers with occupational exposure to blood, hemodialysis patients, and recipients of whole blood, blood cellular components, or plasma being at increased risk.¹⁰ Sexual activity and other types of person-to-person contact, however, have not been generally recognized as important mechanisms of transmission.¹⁰ In addition, 40% of patients with acute HCV infection have no identifiable risk factors.¹⁵

3. Human Immunodeficiency Virus Type 1 (HIV)

HIV adversely affects the immune system, rendering the infected individual vulnerable to a wide variety of infections and other conditions. When an HIV infected individual contracts one or several specified clinical disorders, that individual is diagnosed with acquired immunodeficiency syndrome (AIDS). Transmission of HIV is similar to that of HBV. Groups at higher risk include 1) homosexual and bisexual men, 2) parenteral drug users, and 3) heterosexuals with multiple sexual partners, HIV-infected sexual partners, or sexual partners at risk for HIV infection). These three groups account for over 89% of AIDS cases,¹⁶ and over 80% of HIV infections.¹⁷ Occupational transmission of HIV has been documented in health care workers. As of May 1990, information submitted to the public record indicates at least 65 cases of health care workers whose HIV infections were associated with occupational exposure.¹⁸ Eighteen of the 30 case reports published in the scientific literature as of May 1990 were seroconverted following a documented exposure incident. Eleven of these 18 seroconversions were caused by needlesticks.¹⁸ The actual risk of seroconverting following a needlestick with HIV infected blood is approximately 0.4%.¹⁹ As with the HBV and no studies have identified animal handlers being at increased risk for occupationally acquired HIV infections.

VI. RESULTS AND DISCUSSION

A. ENVIRONMENTAL

Exposure to pyrethrin was below the sampling and analytical limit detection ($< 1 \text{ mg/M}^3$) at the time of the NIOSH visit. The NIOSH Recommended Exposure Limit for pyrethrin is 5 mg/M^3 . Overexposure to pyrethrin was considered to be unlikely at this facility due to the small amounts of dilute solution being used and the short duration of exposure.

Observations of cleaning practices revealed no unusual or hazardous practices and indicated that excessive exposure to cleaning products would be unlikely as long as the product label instructions are followed.

B. MEDICAL

All nine currently employed KT's and ACO's were interviewed. Of the former KT's and ACO's, 2 were interviewed in person, 6 were interviewed by telephone, and 6 could not be located.

1. Symptoms

None of the current workers complained of skin, neurologic, or respiratory symptoms associated with work, but two former employees reported work-related respiratory symptoms which resolved after discontinuing work. Although these respiratory symptoms were not suggestive of asthma, they could have represented upper airway or irritant reactions related to an exposure. All of the current and former workers noted the unpleasant odor from decaying road-killed animals in the wall refrigerator. Many employees stated the odor caused minimal nausea and/or mild headaches.

2. Work Practices

Four of the nine (44%) current employees reported sticking themselves with a needle at least once during their employment with MVAC. The stick typically occurred during the injection procedure or re-capping process. Two (22%) reported seeing other employees sticking themselves. Four of the 8 (50%) former employees interviewed reported sticking themselves with a needle at least once while employed with MVAC. Seven of the 8 (88%) reported seeing other employees sticking themselves.

Current and former ACO's rarely reused needles. If needles were reused, never were there more than two animals killed with the same needle. KT's, on the other hand, reported that they almost

always reused needles, with most employees destroying three four animals with the same needle. Occasionally, used needles were recapped and saved for later use.

3. Medical Conditions

In 1992, one employee was diagnosed with previous infection HBV and current infection with HCV. Serologic tests for the were negative in 1986 during a blood donation. This employee reported none of the risk factors associated with HBV and HCV infections. This investigation could not determine the source of this employee's HBV and HCV infection other than to note that the HBV infection occurred sometime between 1986 and 1992. As discussed earlier, there would be no reason to suspect that HCV infection would be related to contact with animals or animal blood (other than from laboratory-infected primates).

VII. CONCLUSIONS

Based on the NIOSH investigators' observations of current work practices, the environmental sampling data for pyrethrin, and the general lack of persistent symptoms experienced by employees, we conclude that employees of MVAC were not at increased risk for adverse health conditions due to chemical exposures. Acute respiratory symptoms could possibly represent upper airway irritant or allergic reaction to animal exposure. The odor of decaying animals probably contributed to employee discomfort, but no long-term health effects are known to result from this exposure.

Although the opportunity for exposure to human blood by needlestick during the euthanasia process is theoretically possible (e.g., by employees being stuck by the same needle), it is highly unlikely. However, any possible exposure to bloodborne pathogens merits serious concern. Therefore, the following recommendations should be followed to minimize this hazard.

VIII. RECOMMENDATIONS

1. MVAC should forbid the practice of reusing or recapping needles.
2. Needles should be immediately discarded when a needlestick occurs. This is particularly important when two people are performing euthanasia, in order to minimize the possibility of a second needlestick (to the other worker).
3. Needles should be discarded, without recapping, in a container that is closable, puncture resistant, and leakproof on the sides and bottom.

4. Cleaning workers should be trained to use cleaning products strictly in accordance with the label warnings and instructions. This is particularly important when diluting concentrated products and adhering to warnings about the mixing of multiple products. For example, mixing bleach with other cleaning products may release hazardous levels of chlorine gas.
5. The odor of decaying animals should be reduced. Possible solutions may include:
 - a) venting the refrigerated air outside the building,
 - b) moving the refrigerator out of the building,
 - c) increasing the frequency of removing dead animals from the facility, or
 - d) reducing the storage temperature to below freezing.
6. A quarterly respiratory symptom questionnaire should be distributed to employees exposed to animals. Workers with symptoms should be referred to health care providers for further evaluation.

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